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**Egyptian Electricity Holding Company & USAID Program
Power Pool Development**

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File: GA6.2/812-del1

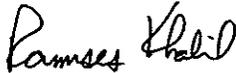
Cairo, August 30, 2000

SUBJECT: Indefinite Quantity Contract (LAG-I-00-98-00006-00-812)

TASK: Power Pooling in Egypt- IQC Task Order 812
Kick-off Meeting Notes

Please find attached the meeting notes from the Kick-off meeting with EEHC.
In keeping with the subject contract this is the first deliverable in Phase I the situation review.

Sincerely Yours,



Ramses Khalil
Deputy Project Manager
Power Pool development

Meeting Notes - August 2000

Sunday, 20 August 2000

Dr. Hassan A. Younes, Kamel Yassin, and Abdel Maguid Neimr, EEHC - Operations Department

- They would like to concentrate on the up-front issues; want to finalize the main issues within 6 months, such as contracts with the Electricity Companies (ECs). We could be advisors for those activities.
- They don't have a real-time system to set transfer prices - only at the end of the year. Want to get a system in place before the IPPs go on line.
- Plans are to split off the generation in the ECs into about 4 thermal generating companies (GENCOs) and 1 hydro GENCO; the thermal GENCOs will be 49% privatized, with the Government of Egypt (GOE) retaining 51%. The hydro GENCO will remain 100% GOE owned. This has not been announced yet.
- EEHC itself has the high voltage network and the National Energy Control Center (NECC). Maybe that will be made into a separate company also, 100% GOE owned.
- They have collected most of the data we requested. Will review and deliver it later.
- They would like to know what can be done in 6 months, what could be spread over the full 18 month contract period.
- Main issues include:
 - Responsibility of each player
 - Structure of the power pool
 - How to run the system in real time, and how to plan the system.
 - Experiences from different countries
 - There must be 7 distribution companies (DISCOs) as there are now.
 - There must be a uniform national tariff schedule as there is now. The tariffs subsidize low income groups.
 - Want the rules for power pool operation to be transparent and fair to all, including the minority (49%) owners of the firms.
- Main objectives for privatization of the DISCOs: raise money for the GOE, improve efficiency of the firms. Can sell only 49% maximum of the firms to be privatized.
- There is only one supplier for natural gas and for oil throughout the country. The prices are set for both gas and oil by the GOE, and probably will still be set by the GOE if the fuel companies are sold off.
- The power purchase prices for the independent power producer (IPP) projects, also called build-own-operate-transfer (BOOT) projects are set in the power purchase agreements (PPAs), as are the fuel supply prices. EEHC or EEA are the signatories; the central bank is the guarantor.

Meeting Notes - August 2000

- For the privatization of the GENCOs, mostly they want to improve efficiency. For the DISCOs, they also want to obtain funds to improve the systems.
- Now they run the system to minimize overall costs.
- Wheeling charges are the same per kWh for all transactions.
- Now, energy transfers add 5% to the cost of the energy transferred as a profit margin.
- The 4 thermal GENCOs will have overall costs about the same.
- The BOOTs are independent and privately owned, not part of any GENCO-to-be. The first project is due on line in January 2002.

Moustefa A. Swidan, attendees of meeting above, and Fawzia Abou Neima, EEHC - Various Departments

- For purposes of our study, we should assume that the generation is broken out of the ECs. Everything else is the same as today.
- Everyone in EEHC will give us their full cooperation in the study.
- All the firms (DISCOs and GENCOs) must be self supporting - there will be no subsidies from the GOE.
- The uniform national tariff schedule will be maintained - but the tariff levels themselves may change with inflation, etc..
- We will provide Chairman Swidan a presentation around the start of my next visit, about September 16 or so.

Monday, 21 August 2000

Fawzia Abou Neima, EEHC - Department of Affiliated Companies Affairs

- Her department is responsible for transfer pricing among the companies.
- Like power pooling approach to address several issues:
 - The ECs complain about the generation's operation being directed by NECC; they think they could do better.
 - The need to distribute the benefits of the low-cost hydro among everyone
 - The ECs do not know the impact of the energy transfers among firms until the end of the year.
 - The selling price to consumers (tariff schedule) is the same throughout the country.
 - The companies need to be responsible for their own decisions.
- There are 15 firms that buy directly from EEHC. They are all served at high voltage (i.e., EEHC's system). They all pay 6.8 piastres/kWh except one, Kima.
- Tariffs do not take into account a return on investment, but they do account for depreciation and interest.

Meeting Notes - August 2000

- Tariff levels have been the same since 1992. Net income is going down all the time.
- There was a presidential decree in 1996 to set up a regulator. It did not address all responsibilities, so can't really use it. Recently there has been a new decree prepared on the same issue, which the Cabinet has approved. The President is expected to sign it imminently; there is a six month implementation plan.
- The BOOT prices are set for 20 years. There are provisions to account for inflation, depending on the category of expenditure.
- Part of the objective of privatization is to re-engineer the firms and improve their operations. The value of the firms will be very low. Need to improve the firms before raising tariffs.
- USAID will be supporting a project in re-engineering..
- Keeping tariffs as low as possible is a crucial objective.
- There is a big difference in revenues among the ECs due to the customer mix. Those with a lot of subsidized customers have less revenue.
- If the costs of generation were split proportionally among the ECs, 3 of so would be losing money.

Tuesday, 22 August 2000

Kamel Yassim and Nagwa Mosaad, EEHC - NECC

- NECC controls the 500, 220, and 132 kV system, including the lines and the substations with those voltages.
- At one time there was a plan for the ECs to take over the 220 kV and below. This has changed; the ECs will have only the 66 kV and below.
- NEC controls the dispatch and maintenance schedules for the generators even though they are owned by the ECs.
- Unit commitment: unit with lowest full load heat rate is committed first, then second lowest, etc., until can meet daily peak plus reserves (including whatever hydro is available).
- Reserve margins: 250 MW of primary reserve; allows the first step of load shedding if lose largest unit. They did economic analysis that showed that this level of reliability was better than 450 MW.
- Reliability criteria is 1 day in about 3 years.
- Most of the 66 kV nets are radial.
- Planning is done at EEHC, even for the 66 kV network.
- There will be an operating committee with each BOOT. rules governing their dispatch will be developed by these committees.
- Prices to the BOOTs depend on the load point at which they are dispatched.
- System load minimum is about 60 - 70% of maximum on a daily basis.

Meeting Notes - August 2000

- The older units were not designed for cycling.
- Hydro is used for peak shaving. The Ministry of Irrigation and Water Resources gives NECC a rolling 10 day schedule of daily releases, which NEC follows in directing the hourly releases.
- They use the hydro and some thermal for frequency control.
- Primary control is through generator action. They leave about 10% of each units capacity unloaded, e.g. 30 MW of 300. If there is a disturbance, they can get about 15 MW of that in the first few seconds from generator droop response.
- Secondary control is through AGC.
- Right now there are some problems with frequency, due to high demand and some units not coming back from maintenance on time.
- The ECs own the remote generation. There is very little now - the grid has been extended a lot. Sinai and the Red Sea are on 220 kV now.
- Operating criteria for voltage: plus or minus 5% for normal operation, 10% for emergencies. Can be a bit worse in some areas.
- Cairo is about 1/3 of overall load.
- Question about arc furnace loads affecting frequency. Can we find some such information for NECC on that subject.
- Maybe need more management to improve the generators, more investment to improve the distributors
- Would like a schedule of our future activities, so they can arrange meetings, get information, etc., including visits to the ECs.
- Would like to get summary of experience of other countries regards power pooling - not just those where Bechtel has done the work.
- What visits will they make (to these other countries)?
- Would like to see a range of power pools discussed.
- EEHC works Saturday - Wednesday. Some of the ECs are the same, but most work Sunday - Thursday.
- Issues to be addressed in our definition of the power pool:
 - Who will do the planning for the DISCOs (for the low voltage networks and for their demand)?
 - Need a clear set-up of workable relationships among all players
 - Who is supposed to do what?
 - How will dispatch be handled?
 - What will NECC do?
 - What is the role of the neighboring countries in the pool?
 - What is the phasing of the pool?
 - What is the end point - can it go all the way to a fully competitive pool, for example?

Meeting Notes - August 2000

- Who will have the contracts with the generators?
- Can there be long-term contracts between say a generator and a distributor?
- Roll of the regulator?

Wednesday, 23 August 2000

Dr. Eng. Mohamed M. Awad, Ahmed K. Hegazy, and Eng. Rawia Kamel, EEHC - Department of Planning, Studies, and Engineering

- Dr. Awad summarized the functions of the four main sections in his department:
 - Generation planning, including load forecasting, and economic studies
 - Transmission planning, including interconnections, and some environmental issues
 - Engineering research
 - Information technology for all of EEHC and the Ministry.
- Forecast load growth: 6% per year for next five years, 5.5% per year thereafter.
- From our study, he would like to see: us to provide software to forecast generation exchange among the ECs over the high voltage system. Basically, like to see load flows based on optimal dispatch. They do static load flows for planned expansion. They have some GE software, not fully satisfied with it.
- Like us to tell them how they can help. Show them a schedule of activities, how they will work with us.
- Arranged for the General Directors of two of the sections to meet with us at 10 a.m. on Monday.

Sunday, 27 August 2000

Dr. Hassan A. Younes and Dr. Kamel Yassin, EEHC - Operations Department; Iqbal Chaudhry, USAID

- We went over in detail and discussed our presentation regarding our initial findings. EEHC had many useful comments, which we will incorporate in later related documents.
- EEHC would like to get a summary of the experiences of others in power pooling.
- EEHC would like to see a summary of the objectives of other power pools.
- We discussed the need for subsidies to some of the Distribution Companies. EEHC noted that providing subsidies (through favorable generation pricing) to Distribution Companies that were partly privately owned might be questioned.
- What EEHC is most interested in getting within six months is a description of the power pool, its structure, draft contracts, and the like. The technical details (communications, etc.) can come later.

Meeting Notes - August 2000

- EEHC will try to arrange meetings for us with the Minister of Electricity and Energy, the Deputy Chairman for Financial and Economic Affairs, the Chairman of the Cairo electricity company and its CEO for generation, two similar people (one from distribution, one from generation) from Upper Egypt (especially a hydro person), Canal, Middle Egypt, and Behaira.
- We will get from USAID whatever documents they have in English regarding the legal and regulatory framework. Whatever USAID doesn't have, EEHC will get.
- We tentatively arranged a presentation to a larger group (Dr. Swidan and representatives of all the affected EEHC organizations) some time during 25 - 27 September. We would discuss pool models, lay out the constraints and other key data, and discuss the implications regarding the Egyptian power pool.
- EEHC asked about the timing of the tours of other power pools. This has not yet been arranged, but probably won't start before the meeting around 22-27 September.

Monday, 28 August 2000

Acc. Mahmoud S. Abou Rehab, EEHC

- Objectives for power pool: least cost, most revenue
- Big problem for EEHC and the ECs: cash flow, not profits. Due to arrears, which in some places are more than 26 months. They don't write off the arrears, which is mostly owed by branches of the GOE, so profits are not directly affected. But they don't have much cash, so they can't pay all their bills, and there is a daisy chain of debt.
- This causes the biggest problem for generation, which has no revenues directly.
- He suggests that the 66 kV should be part of the power pool, i.e., not part of distribution, because there are some power transfers among the ECs on 66 kV, and also there are customers on the 66 kV which would help the power pool pay its bills. He wants to provide a real source of funds for the power pool. Revenues on the 66 and 220 kV are about 2 billion Egyptian pounds per year.
- Tariff is too low. Unchanged since 1992. In 1997 fuel prices increased, but no increase in the electricity tariff.
- On average - the tariff schedule provides revenues a little above costs. In Cairo, the fixed assets are about 7 billion pounds, the profit about 100 million pounds. Not much of a return, and combined with the arrears not enough to cover any new investment.
- 95% of the loans in the ECs are for the generation.
- The Cabinet sets the tariff. They don't even allow EEHC to give them a recommendation to change the tariff.
- Will the power pool buy and sell, or just transfer and charge a fee. If it buys and sells, the distribution may not pay it, then it couldn't pay the generation.

Meeting Notes - August 2000

- GOE owes EEHC about 7.7 billion pounds. EEHC owes Ministry of Finance about 11 billion pounds for the loans to the generators. EEHC owes about 1 billion to the fuel company. MOF doesn't want to do a maximum debt exchange because that would cause the 7.7 billion to be showed as an expense on the GOE's accounts, which would have negative connotations.
- Maybe things will get better because the GOE wants to sell parts of the generation and the distribution.
- Now - a ministerial committee started in the previous government has approved most of the good recommendations from the Merrill Lynch study. From 2001 use formula to increase the tariff automatically due to inflation.
- Maybe easier to sell distribution first because no debts, they get first crack at the revenues, small capital means can get decent rate of return easier.
- Merrill Lynch also recommended establishing a regulatory board that could raise tariffs on its own. Probably approval of the regulatory board will come in a few days.
- All BOOTs are connected at 220 kV.
- Probably electricity theft is not important in Egypt.
- Prices from BOOTs are above the sale price from EEHC at 220 kV. Boot price about 2.5 US cents/kWh; 220 kV price 6.8 piastres, less than 2 US cents.
- All organizations in Egypt use the same accounting system, except the GOE.

Acc. Zeinab Shihata, EEHC

- The ECs bill EEHC monthly for the power supplied to EEHC. EEHC offsets that against what they owe EEHC for the loans (to the generators) and for wheeling.
- Prices from the ECs, in piastres/kWh: At 220 kV: Cairo, 8.090; Alexandria, 7.395; Canal, 8.512; Behaira, 7.365; Middle Egypt, 7.346. At 132 kV: Middle Egypt, 7.234; Upper Egypt, 2.102.
- EEHC sells to the customers at high voltage at 6.8 piastres/kWh, except 4.7 to Kima.
- They have a financial model developed by Duke Power, but needs to be modified to reflect the future arrangements in the power sector: distribution and generation separated, etc.
- She gave us financial summaries for 1997/8 and 1998/9 for the ECs and for EEHC. 1999/2000 for EEHC will be coming.

Eng. Hassan El Kammah; Eng. Ahmed K. Hegazy; Eng. Nagui N. El-Gawhi; Eng. Azza Shahin; and Eng. Rowie Kamel; all of EEHC

- EEHC does all the generation and transmission planning (for 500 and 220 kV; and some 66 kV in a few areas. The ECs do not do their own planning in those areas.
- The transmission planning has as criteria voltage plus/minus 5% normal, 8% emergency; load flows must be within 100% of rating normal, 110% emergency; contingency is 2 for 220 kV, 1 for 500 kV; stability (don't know how that is expressed).

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- They have four base cases for planning: high load, high hydro; high load, minimum hydro; low load, high hydro; low load, minimum hydro.
- They use PSS/E version 0.6
- There are no major constraints in the transmission system.
- The remote areas not connected to the main network and served by diesels have only small loads.
- They optimize the system to minimize losses. For high load, high hydro the losses in the 220 and 500 kV systems are 6.5%.
- There is a 400 kV 13 km undersea interconnection to Jordan. When transfers increase they may convert it from AC to DC to carry more load.
- The connection from Alexandria to Tobruk is about 600 km, 220 kV. Maybe upgrade to 500 kV, but highest voltage in Libya is 220 kV
- The load forecasts use several scenarios (low, medium, high). They build up sectoral demand (agriculture, high voltage industry, other industry, residential commercial, public) based on econometric forecasts. They account for losses also.
- Based on forecast load factor, they get peak demand as well as energy.
- It's done for the entire country as a whole, not by EC. they don't have the basic data to do it for the individual ECs.
- They interact with the transmission planners so they can get the substation load forecasts.
- Forecast is about 7% per year for the next two years, about 6% per year averaged over the next 5 years.
- Basis for generation planning is 1 day in 3 years LOLP, and a reserve margin of 15%. They use the EPRI program PGS.
- The units planned to be added include hydro 20%, combined cycles 20%, gas turbines 7%, the rest steam.
- Why steam? They have experience with steam, there are local manufacturers of components, they don't want to rely too much on natural gas, and they don't want to rely too much on one technology.
- Suggest that the power pool be an isolated company to deal with all concerned parties.
- They will provide us load flows for the four base cases, the current transmission plan, the current generation plan, and the current load forecast. We will pick up on Wednesday.

Wednesday, 30 August 2000

Dr. Ali F. El Saiedi, Ministry of Electricity and Energy; Dr. Hassan A. Younes, EEHC

- The Minister described plans for the reform of the electricity sector: generation to be split from distribution into 4 thermal and 1 hydro companies, EHV and NECC

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to become a separate company, distribution could be 49% privatized,, generation already has some BOOTS coming, there may be some IPPs later. EEHC also has some other functions that will be split off into separate companies such as engineering and studies and a fiber optics network.

- We gave a brief presentation which summarized the objectives of power pools around the world and the key objectives for the Egyptian power pool, provided an overview of our project, and solicited the Government of Egypt's views in several areas related to the power pool.
- He asked how the power pool would fit with the interconnections and indicated the need to incorporate the concept of the power pool to the interconnection partners.
- He mentioned a coordination center for the interconnections.
- He indicated that the schedule for our project fit nicely with other plans for the power sector: forming the regulator in early spring, separating generation and distribution early next year, etc..
- When asked about spreading the benefits of low cost hydro in part to 49% privately owned distributors, he stated that when the costs of all generators went into the pool, then distributors bought from the pool and no single distributor bought directly from the hydro, so that was probably OK.
- We mentioned that there would be a presentation covering the options for the power pool, advantages and disadvantages, constraints, etc., in late September, for the main players (from the Electricity Companies, etc.).

Dr. Hassan A. Younes, EEHC

- We described our initial thoughts regarding building awareness: first a trip for a group to Harare to visit SAPP coordination center and talk to Bill Balet, formerly Executive Director of the new York Power Pool, then later trips (not yet defined) to the US.
- He asked about visiting Europe to get their experience. Where would be our judgment, but possibly the UK, Switzerland (Loftenbourse?).
- We discussed sending different groups on the different tours, to expose more people and take less of each person's time. Then they would meet, make presentations of what they learned.
- He indicated there should be a workshop for the senior management in the different entities about power pools.
- He arranged meetings with the head generation and distribution people, including the Chairman, in the ECs from Middle Egypt (to be held in Cairo), and Delta. The Chairman for Canal is out until next week; he will arrange that when that man returns. Ramses will try to arrange with Alexandria, where he knows the Chairman. If necessary Dr. Younes will help.



System Analysis Tools

(For Discussion Purpose)

Nexant

Bechtel Technology and Consulting



Background

- Current system planning software tool from PTI can handle traditional transmission planning tasks
- NECC has Harris EMS systems which use operation network models
- PTI PSS/E is not designed for power pooling analysis for a deregulated environment



Power Pooling Analysis Needs

- A model generated from same source for planning and operation
- An upgradeable software that can handle various power pools and market operations
- An effective model for T&D planning under various power pool structures
- An analytical software that can identify transmission congestions inter- and intra- ECs
- A software tool that is ready for future interconnection studies



Potential Approach

- Use SCOPE™ from PCA, USA
- SCOPE™ is used in many power pools, Independent System Operators (ISO) and integrated utilities, worldwide
- PCA has a well-proven record for 17 years and long-term support to their clients



Highlights

- Harris EMS uses a part of SCOPE in their OPF application; should be able to seamlessly (after upgrade) put the real-time model into SCOPE without any transformation
- SCOPE can read/write both PSS/E and PSLF formats --- it can interface with existing PTI application which is currently used by EEHC planning department
- SCOPE can perform regional interconnection power transfers and optimization studies



Highlights (conti.)

- SCOPE can handle mixture of the real-time model and planning model --- this allows one to extract the network from the EMS and augment it with the planning models
- SCOPE can analyze, under various power pool structures, transmission congestions, pooling operations, market simulations, etc.



Advantages

- The project team can use SCOPE (and work with EEHC/EC and NECC/RCC) for operation/planning analysis and simulation; in order to identify potential limitations of alternative power pool structures
- The PCA software can be upgraded to handle any power pooling and market activities, once the Egypt power pool structure is decided – it will be useful for planning and operation
- MODELEX™ (also from PCA) can produce a simple and accurate external network model of Mid-East and its neighbors as input to SCOPE for regional power transfer and optimization studies